FD/ND, Low-ν Fit, and ND-Location

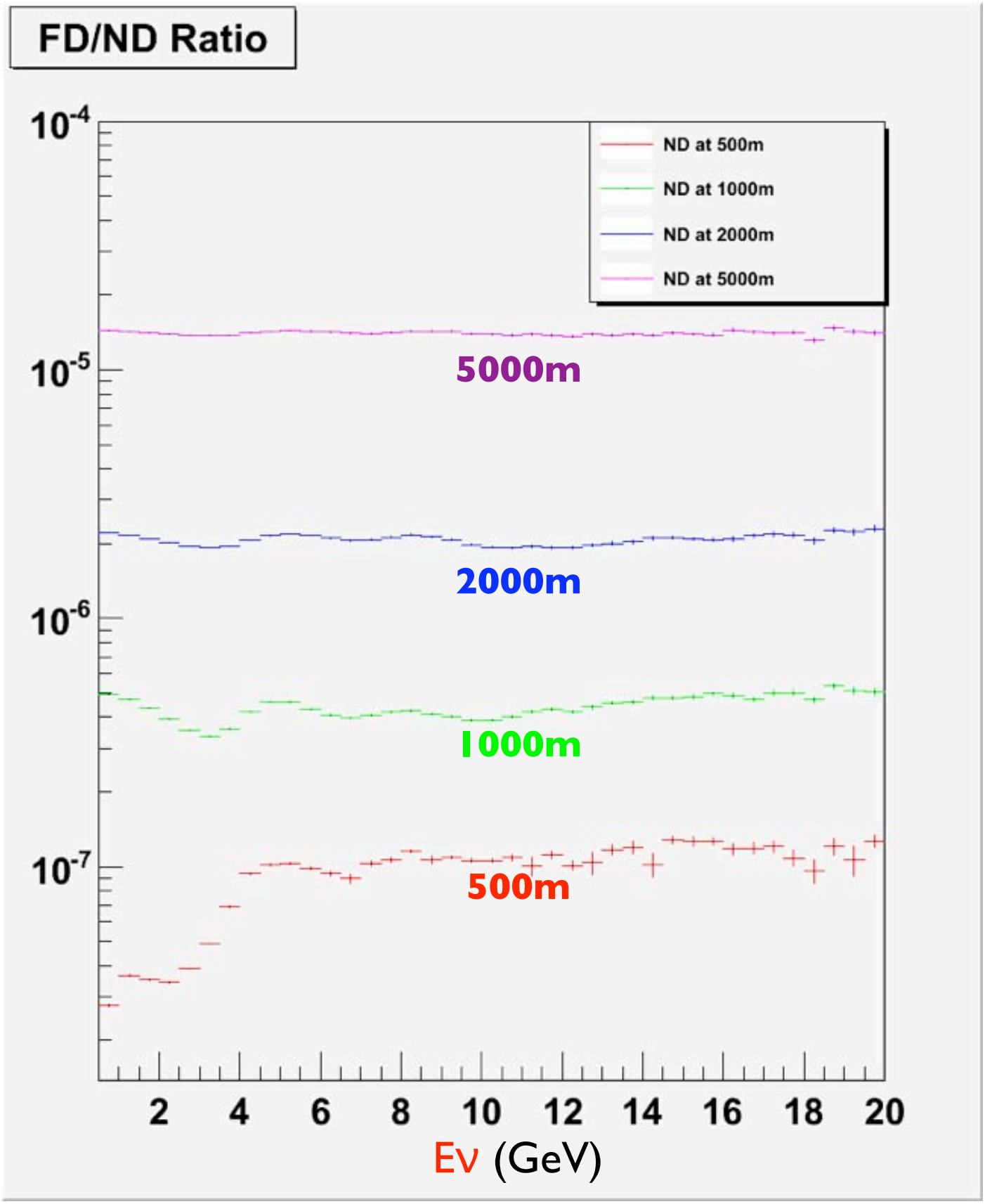
- *Flux(Ev), i.e. Shape, determined using Low-ν Technique with HiResMnu-ND*
  Default: ND@1000m FD @ 1300km

- Farther the ND, closer the ND-flux to the FD

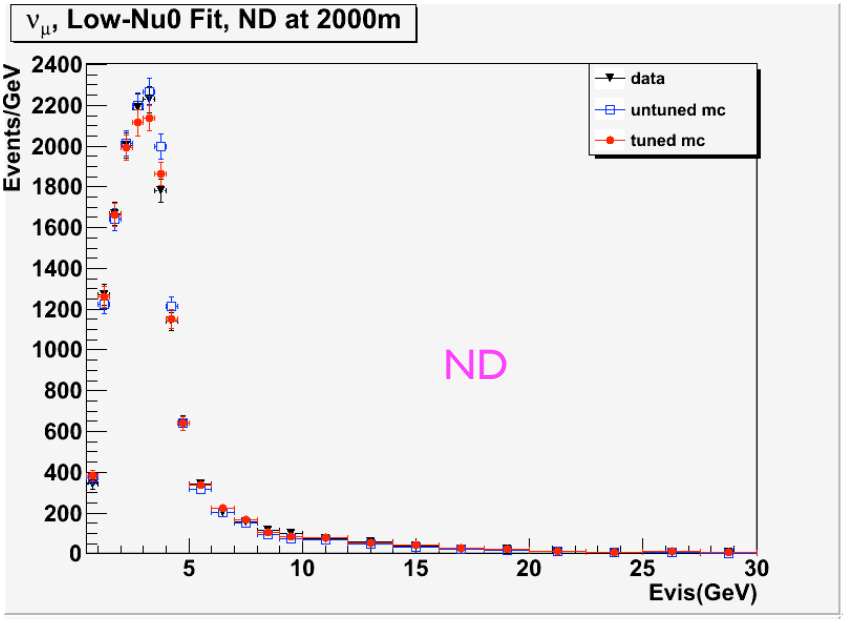
- Closer the ND, higher the flux at ND & cheaper will be the ND-hall

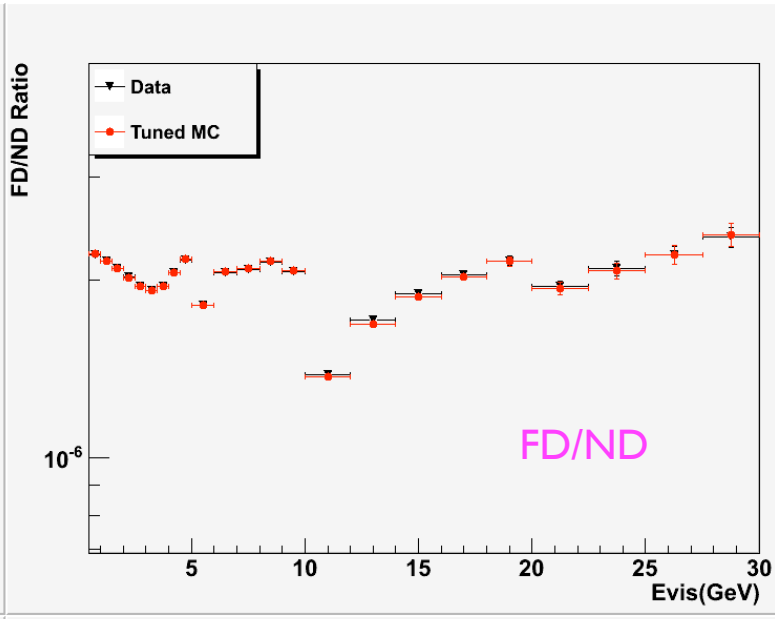
- How well can we predict the FD/ND?

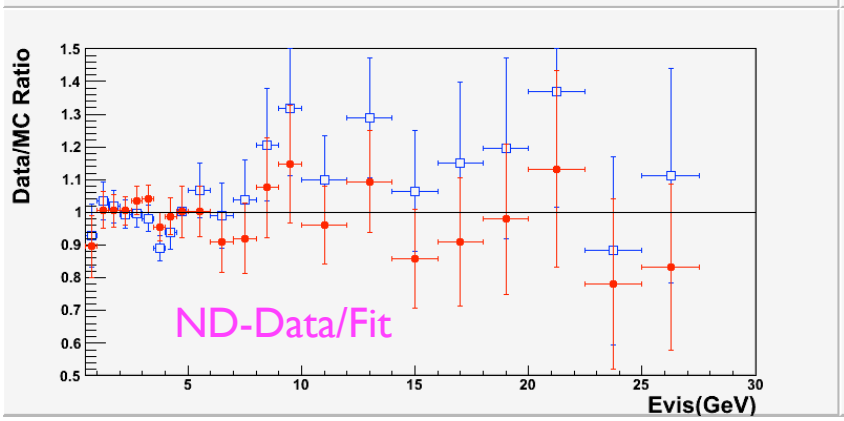
  - ND at 500m, 750m, 1000m, 1500m, 2000m
  - Fitted the Mock-data at ND and predict FD/ND
    - νμ
    - & Anti-νμ

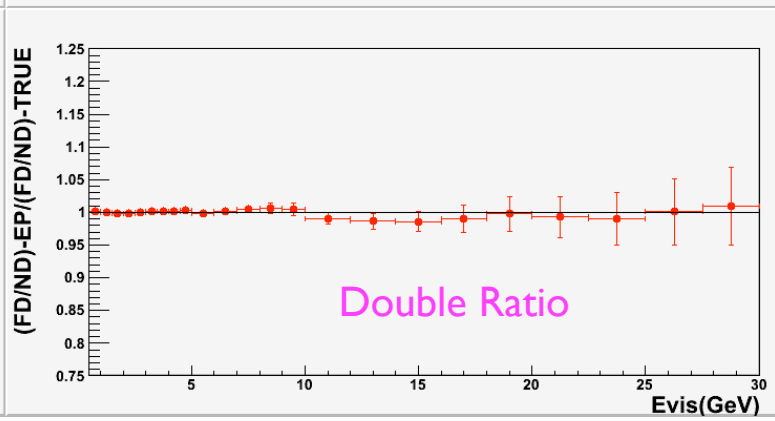

FD/ND Ratio
ND at 500m
ND at 1000m
ND at 2000m
ND at 5000m
10-4
10-5
10-6
10-7
5000m
2000m
1000m
500m
2
4
6
8
10
12
14
16
18
20
Eν (GeV)

ND at 2000m: νμ

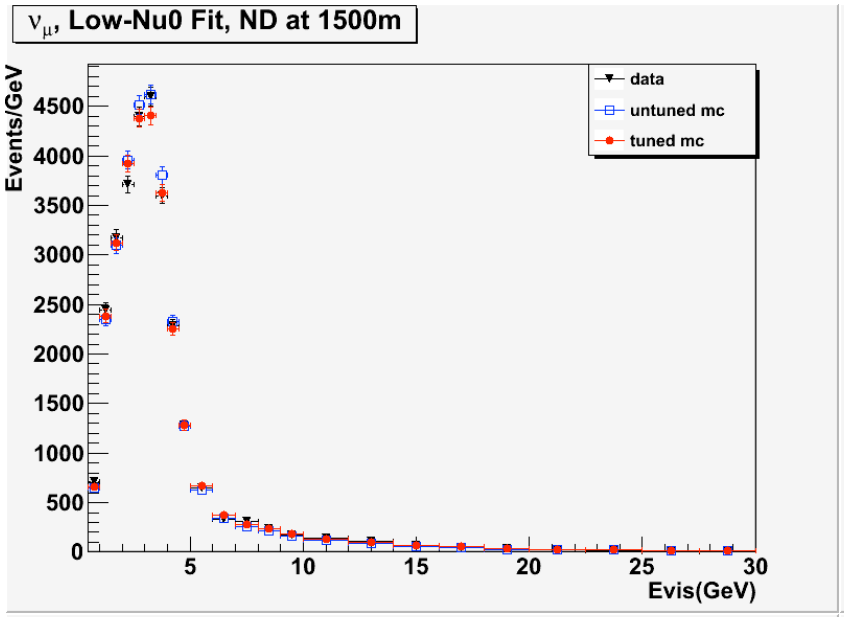


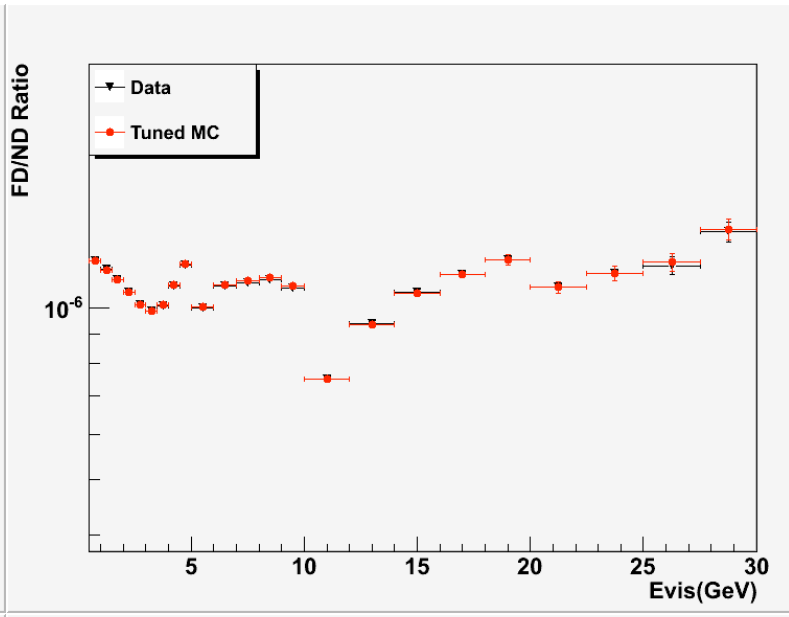


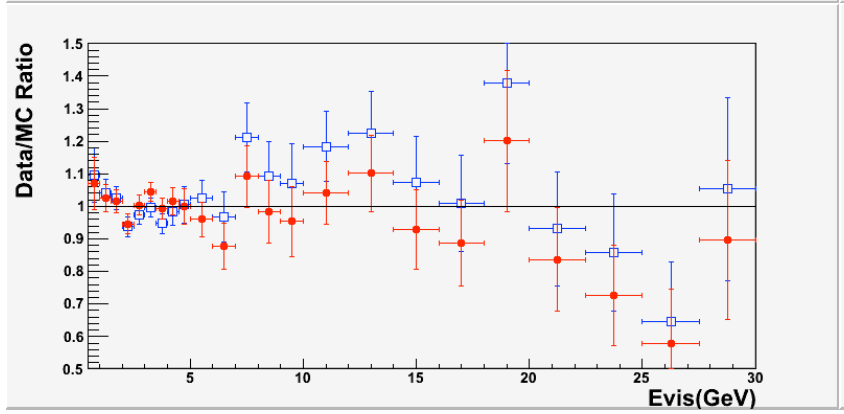


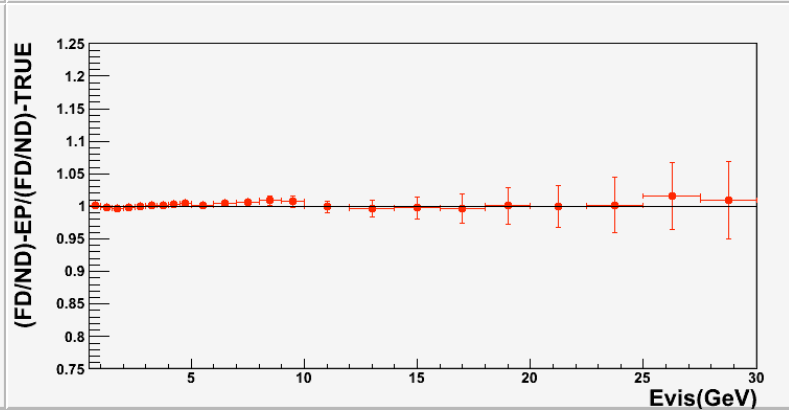


ND at 1500m: νμ

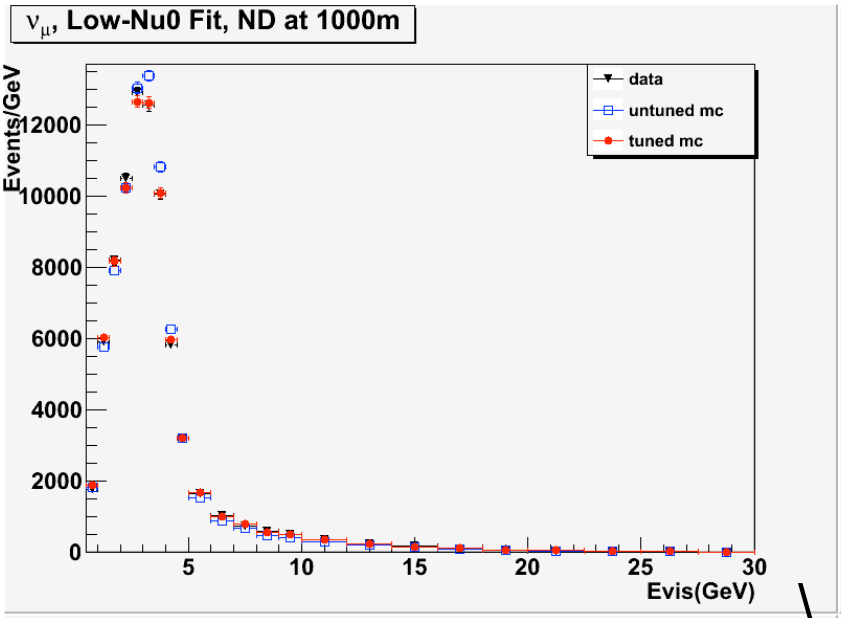


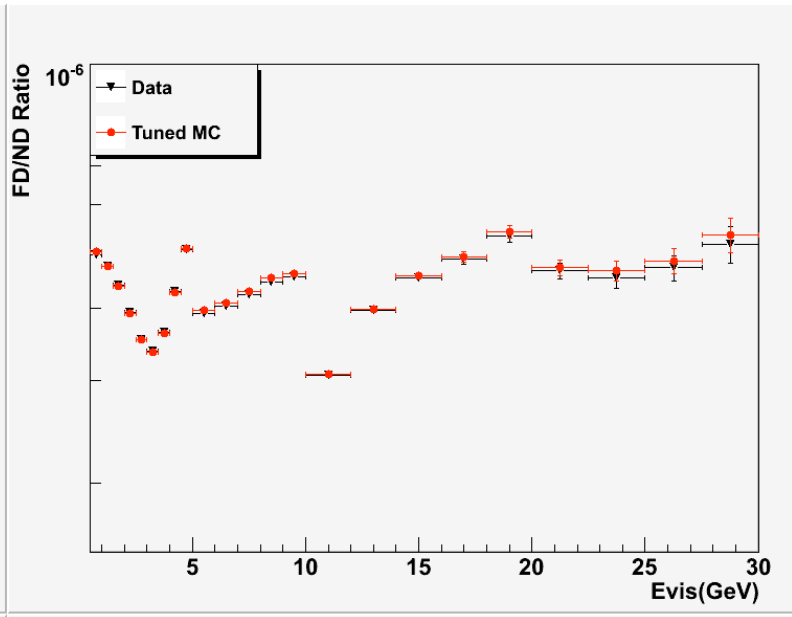


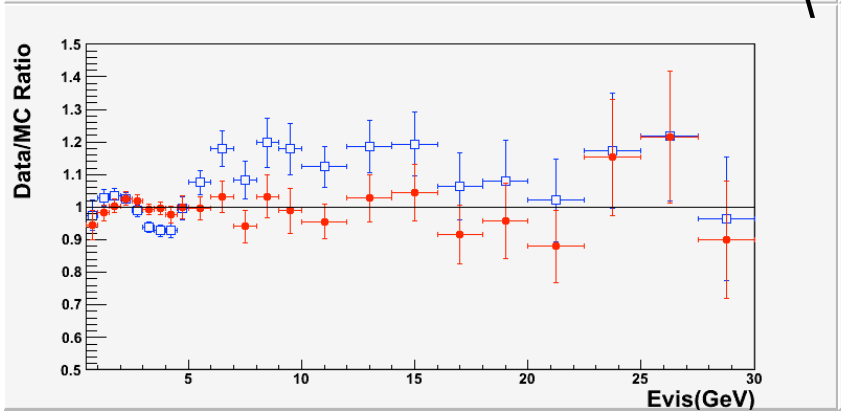


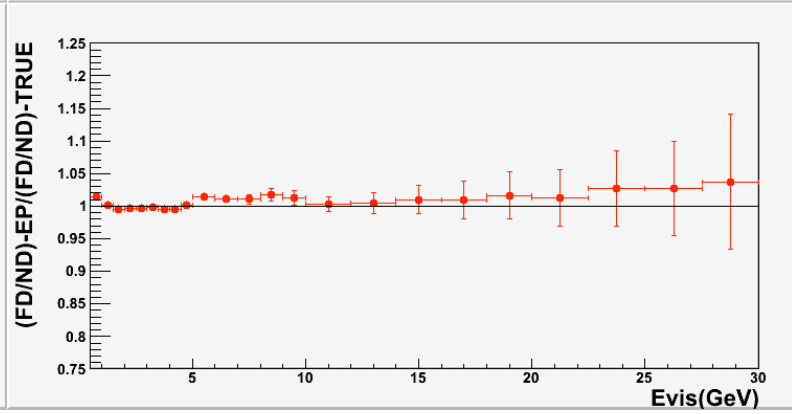


ND at 1000m: νμ (Default)

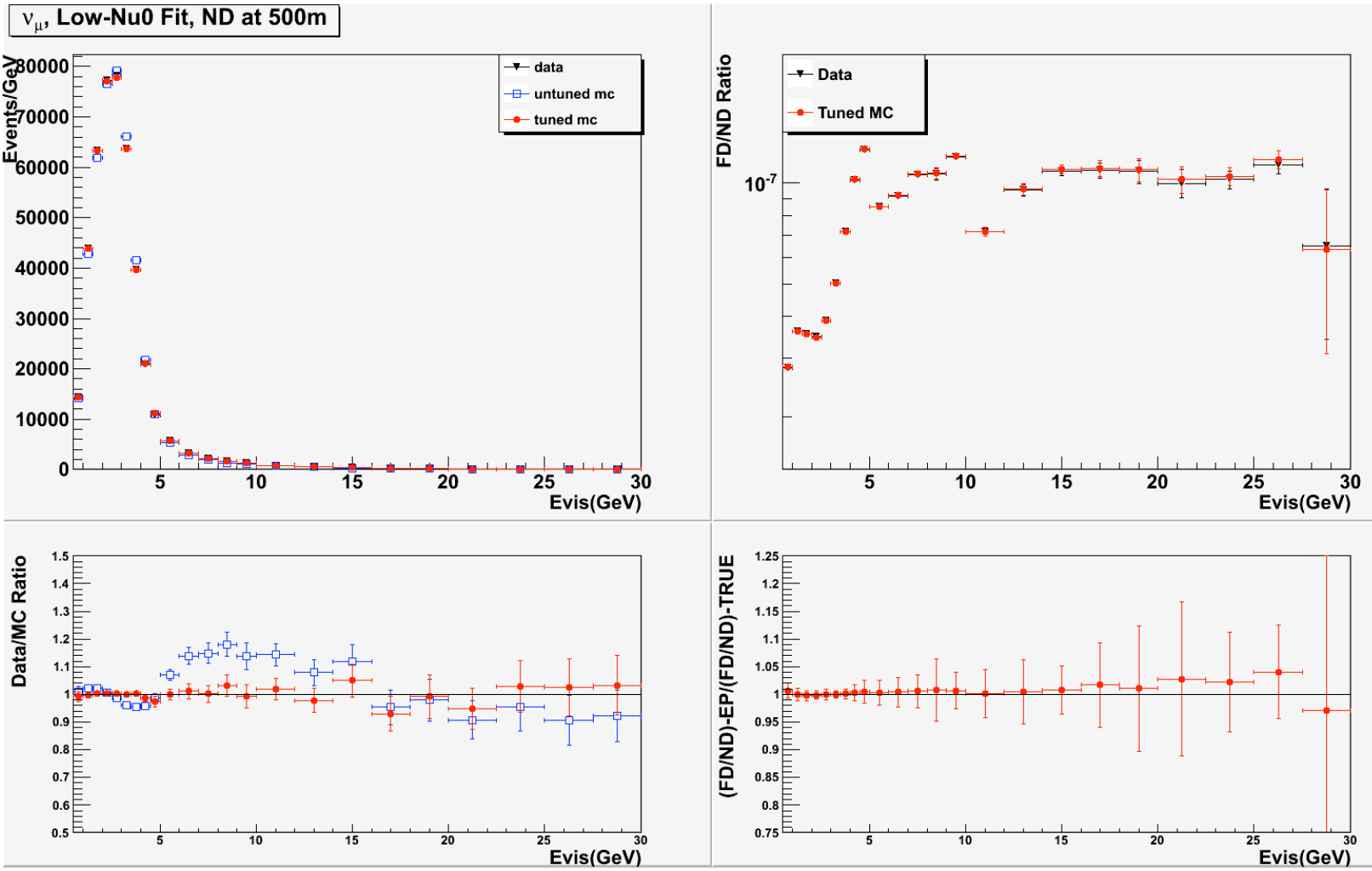






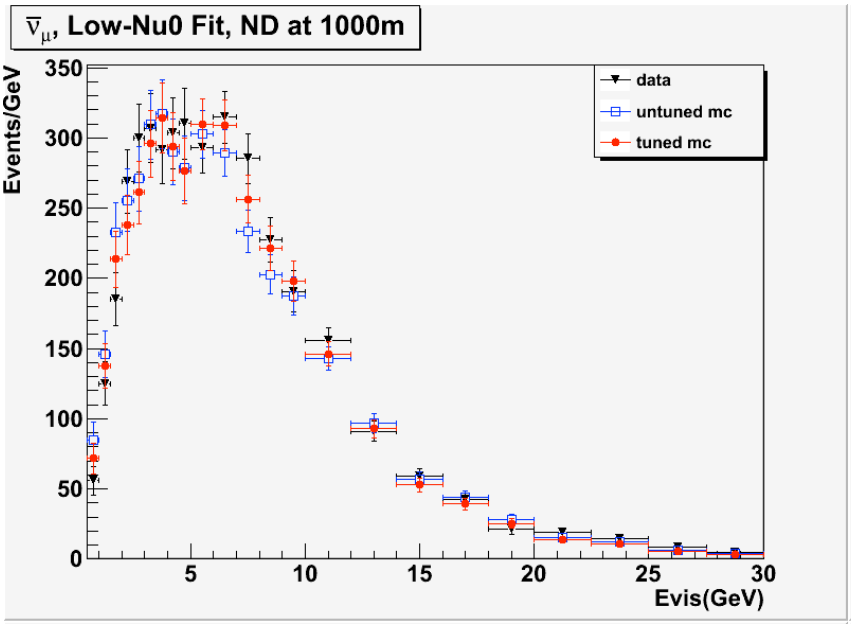


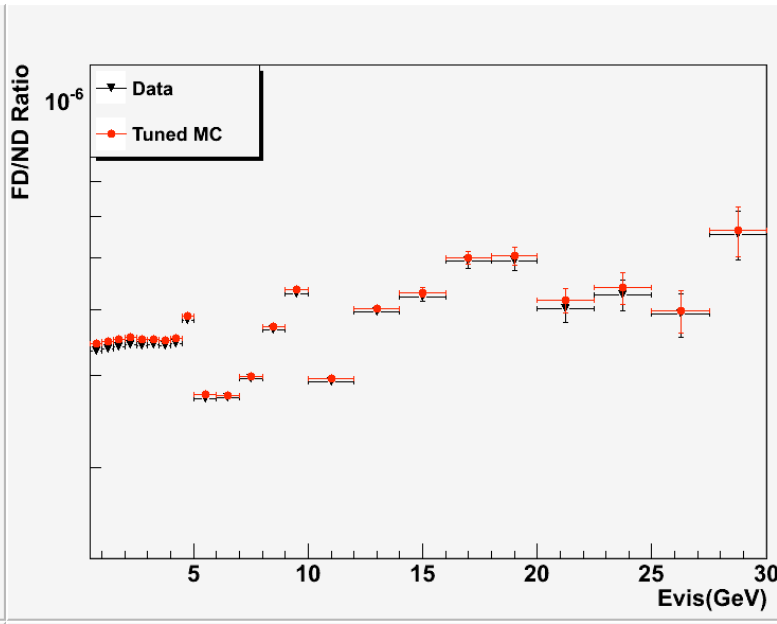
ND at 500m: νμ

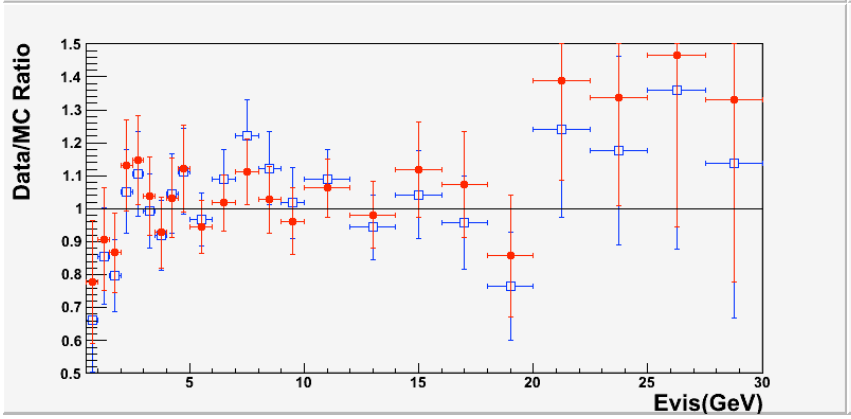


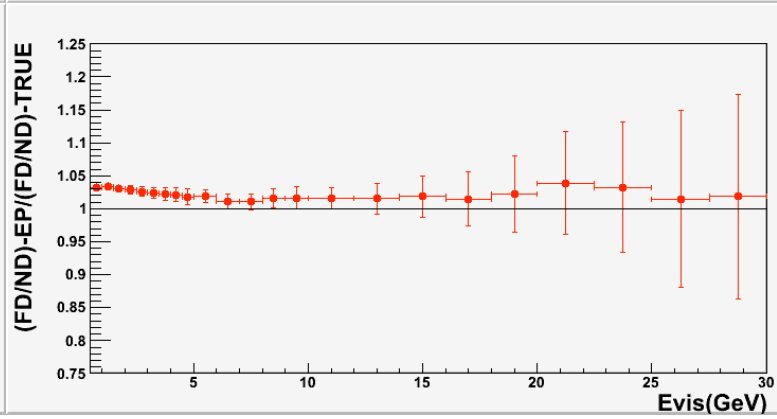
(ND at 750m: νμ similar)

ND at 1000m: Anti-νμ

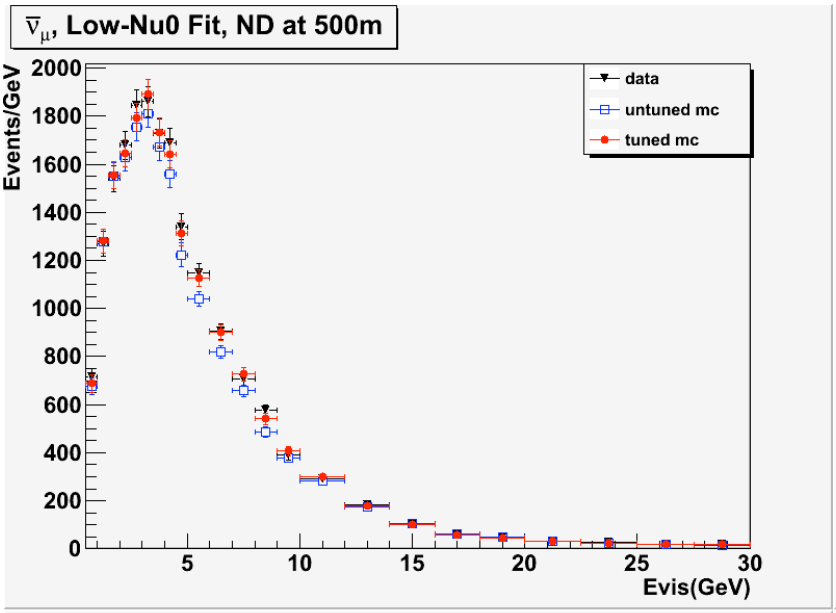


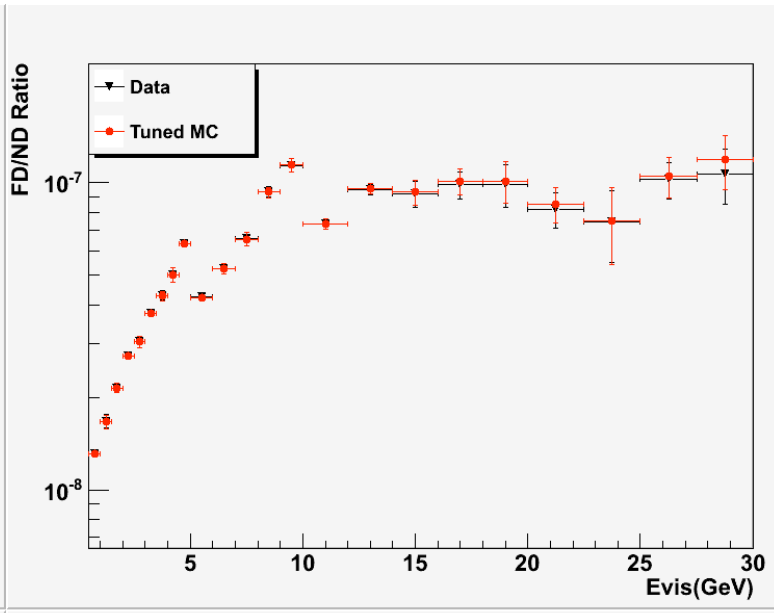


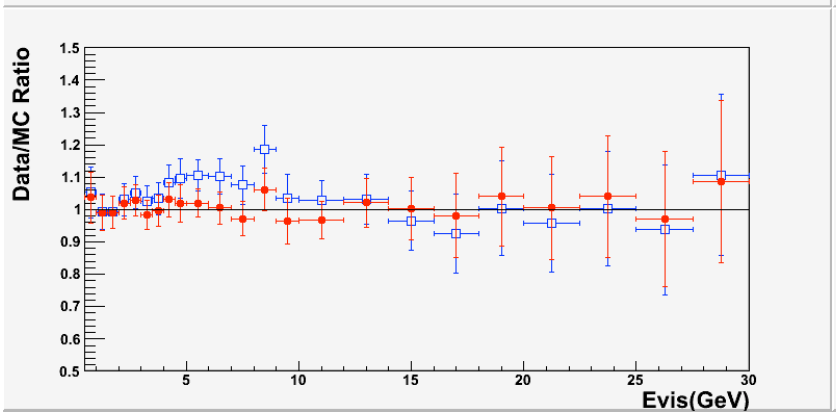


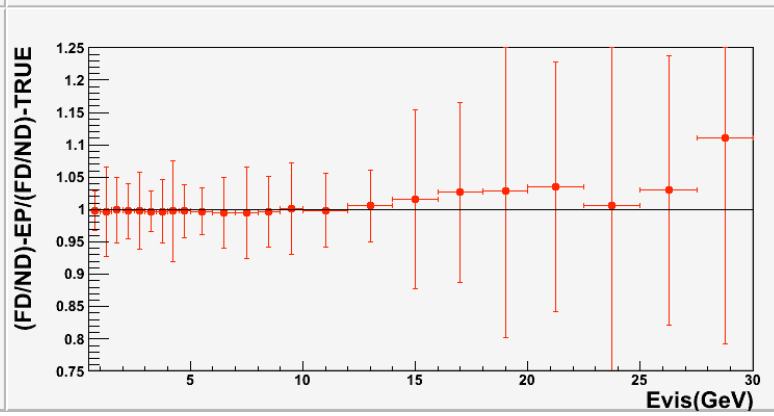


ND at 500m: Anti-νμ









My Preliminary Conclusions on the ND-Location

- We get 4-times the Nu-flux at 500m than at 1000m

- Low-ν0 EP-Fit to the ND mock-data shows that the prediction for FD/ND when ND is at 500m is as good as when ND is at 1000m
  - νμ
  - & Anti-νμ

- Up to comments/questions/critiques, the study shows that we should build the ND-hall as close to the decay region as feasible

Backup Slides

Relative Flux Determination using Low-ν Technique

E.P. of $\pi^{\pm}$ & $K^{\pm}$ using Low-ν Events

Low-ν^0 Flux Method

⇐SRM(1990): Used by CCFR, NOMAD, NuTeV, MINOS..

$$N(E_\nu : E_{HAD} < \nu^0) = C\,\Phi(E_\nu) * \left[1 + \left(\frac{\nu^0}{E_\nu}\right)\frac{B}{A} + \left(\frac{\nu^0}{E_\nu}\right)^2\frac{C}{A} + O\left(\frac{\nu^0}{E_\nu}\right)^3\right]$$

$\nu \Rightarrow \frac{B}{A} \sim -0.3$; $\bar{\nu} \Rightarrow \frac{B}{A} \sim -1.7$

⇐[..] ~ 0.97 for Ev=5 & ν0=1 GeV

⇒ Systematically robust

⇒ $\nu^0 \ll E_\nu \Rightarrow E_\mu$ critical measureable

E.P. of π/K

fit $\frac{d\sigma}{dx_F\, dP_T^2} = f(x_F)\,g(P_T) * h(x_F, P_T)$

Low-ν C.P. of ν_μ ($\bar{\nu}_\mu$) Flux

Get C.P. of $\pi^\pm$, $K^\pm$

Allows predictions at ND, FD, FD/ND

Yields $\pi^\pm \to \mu^\pm$; $K^\pm \to \overset{(-)}{\nu}_e$

Functional-form constraint allows flux prediction to $E_\nu \sim \nu^0$

Absorbs errors in beam-simulation parameters into "prod^n - σ" $\Rightarrow$ "EFFECTIVE"

Systematics

- Variation in ν^o correction
- Composition of cc : QE, Res, Dis
- Functional form
- Beam - Transport ← Syst. at 500m?
- Energy scale : E_μ, E_{HAD}